ARMORED WHEELED VEHICLE COMPOSED OF INDIVIDUAL SECTIONS

The invention relates to an armored wheeled vehicle that is composed of individual sections and has a drive section, which contains a drive unit, as well as a mission section that can be detachably coupled to the rear portion of the drive section via a vertical plane of separation. A vehicle of this type is described, for example, in DT 25 27 100 A1 and in US patent 4,031,807 A. The known vehicle has two dual-axled drive segments that contain a drive unit and between which a mission segment, for example equipped with a weapon, is suspended via detachable couplings containing a vertical pivot axis. This configuration serves to provide an overall vehicle that is capable of cross-country travel and that, due to the movability of the individual sections relative to one another, can cross obstacles considerably easier than can a rigid vehicle.

For international applications, these days increasingly light armored vehicles are necessary that can be rapidly transported by air and with little logistical expenditure. The weight of armored wheeled vehicles frequently exceeds the permissible load capacity for transport by aircraft and helicopters. Therefore, vehicle systems are required that

Literal trnsl of PCT/DE2003/002384 filed 16 July 2003 / Michael Hönlinger et al / Krauss-Maffei Wegmann GmbH & Co. KG / 03-12-47

can be separated for air transport in such a way that their individual partial weights remain below the permissible load capacity.

Separable vehicle systems are known, and depending upon their type of connection can be classified into two groups.

A first group relates to sectioned vehicles having coupling links, as they are described in the aforementioned documents. This vehicle system is characterized by self-supporting vehicle sections that contain automotive components and are connected by coupling links. For example, vehicle sections can operate independently of one another if they contain a chassis and drive system. Examples are semi-trailers, articulated buses, railed vehicles, construction equipment having an articulated hinge.

The goal of the segmentation is the composition of shorter or longer vehicle systems from individual sections. By means of the coupling links, pitch and articulation angles are possible between sections that enable an adequate to high movability in narrow curves and in uneven countryside.

A second group relates to modularly composed vehicles having a supporting vehicle structure and a work module. In this connection, a supporting vehicle structure contains all automotive components, while the work module, in the form of a box or a mission module, is placed upon the supporting vehicle structure. Vehicles that are composed of modules are described, for example, in DE 40 14 192 A1 and EP 11 11 324 A1. The advantage of these vehicle systems is that an easily exchangeable work module is provided that is functional independently of the drive module. The drive module can therefore also be operated without the work module. Each of the two above described vehicle systems has specific drawbacks.

The drawback of sectioned vehicles having coupling links consists in their reduced speed when driving through curves, on bad roads, and in the countryside. The reason is their known rising action of articulations when encountering roadway stimulus or during rapid driving maneuvers (changing of lanes). The lower, maximum possible average speed of sectioned vehicles thus on the whole means a reduction of the mobility. Military vehicles have the further drawback that the coupling location, due to the articulation movement, is difficult to protect ballistically and against mines, especially since doing so would result in an undesired increase in weight.

The drawback of known modular vehicles, comprising a drive module and a work module placed thereon, is the lower structural rigidity of the work module as well as its non-rigid or floating connection to the supporting vehicle structure. The overall rigidity of the vehicle is therefore less than that of a one-part self-supporting vehicle body. The overall system, due to the lower structural rigidity, here also tends to an earlier rising action when in the countryside or when driving rapidly through curves, so that here also lower average speeds can be achieved.

A further drawback is that the supporting drive module contains all of the automotive components and is thus heavier than the work module. An optimum division of weight between drive and work module for air transport is therefore not possible.

The object of the invention is to provide an armored wheeled vehicle, which is composed of individual sections, with the aforementioned features and indicated in the introductory portion of claim 1, the individual sections of which can be embodied as light as possible for air transport and with which a rapid separation and coupling of the vehicle sections from one another is possible without extraneous auxiliary aids.

The uncoupling should preferably be possible under field conditions, even on slightly uneven ground. On the other hand, a fixed connection of the vehicle sections should be ensured to achieve a high resistance of the overall structure to bending and torsion, and this should be comparable to what can be achieved with a one-piece structure. The vehicle, which is composed of sections, should have the same mobility and the same protection as does a non-divided vehicle. Finally, possibilities should be provided for achieving a rapid separation and coupling of the drive, the supply lines and the data lines without extraneous auxiliary means, and it should furthermore be possible to reduce bending and torsion vibrations in the critical frequency range by appropriate structural dampening in the plane of separation of the vehicle sections.

The realization of this object is inventively effected by the features from the characterizing portion of claim 1. Advantageous further developments of the invention are described in the dependent claims.

The basic concept of the invention is to couple the drive section and the mission section to one another in the vertical plane of separation not via a coupling link, but rather rigidly in such a way that a resistance to bending and torsion is achieved that is nearly identical to that of a

one-piece structure. Such a rigid structural coupling respectively presupposes a rear wall on the drive section and a front wall on the mission section, and/or an at least partially peripheral frame profile at the section connection, which on the one hand introduces the local coupling forces into the structure and on the other hand prevents the buckling of the structure. In this connection, the transfer of the transverse forces and torsional moments into the plane of separation is effected by a positive connection that can, for example, have two oppositely disposed bolts that in principle can also undertake the centering function. Self-centering bolts in the coupling cross-section and guide rails thereby enable a rapid guiding together of the two vehicle sections. The joining together of the vehicle sections can be effected either by the transport drive of the drive section or by integrated pulling devices, for example cable wenches, spindles, power cylinders, etc..

The rear wall and front wall, as well as a possible frame profile, can essentially be disposed in a cross-sectional plane, but they can also be offset relative to the cross-sectional plane, so that respectively partial sections are disposed in different cross-sectional planes.

To ensure easy passage between mission section and drive section, it is expedient for the rear wall and front wall to each have a passageway.

With a bolt or screw connection, to avoid a double fit it is advantageous for a bolt to transfer only transverse forces from the torsional moment. This can be realized by an elongated hole or slot. The pre-stressing of the vehicle structure and the transfer of the tension forces from bending, can be effected by screws or pull straps that are disposed directly in the flow of force. The number and the location of the connecting elements, as well as the connection rigidities, can be computed. The pre-stressing of the screws or pull straps can be effected manually or automatically.

The connection of the supply and data lines can be effected via a freely mounted coupling plate having centering pins. With a mechanical drive, the coupling of the Cardan shafts can be effected via a sliding sleeve.

It is furthermore expedient for a dampening layer to be introduced into the separating plane of the vehicle section in order to be able to passively dampen structural vibrations. To improve the driving comfort,

further additional passive or active dampening elements can be provided in the region of the plane of separation in order to further reduce structural vibrations.

The ballistic protection and the protection against mines can, in principle, be achieved by overlapping structural sheets and protective plates in the region of the plane of separation. The air tightness of the interior space can be achieved by a peripheral elastic or inflatable seal in the region of the plane of separation. If the front drive section is equipped with two pivoted axles and a drive, it can also operate as an independent vehicle and can be used for the shunting or joining together of the sections. For this purpose, the steering transfer to the second axle can be uncoupled, and the second axle can be fixed. For vehicle sections having only one axle, it is expedient for extendable support members or support wheels to be provided for the uncoupled removal or placement. Vehicle sections having support wheels and drive means can also undertake shunting functions. Thus, for example, with a vehicle having a diesel electric drive, the electrical drive motors can be disposed in the wheel hubs not only of the drive section but also of the mission section, and batteries can be provided in the mission section to supply the drive motors of the mission section. If the mission section is then equipped with support wheels and an

auxiliary control mechanism is provided, independent shunting movements can be carried out with the uncoupled mission section.

As a consequence of the inventive type of coupling of the vehicle sections it is possible for heavy armored vehicles to be comprised of sections in such a way that the individual sections are suitable for air transport. The coupling mechanism permits a rapid separation and uncoupling of the sections under field conditions. This enables a simple, rapid and economical air transportability of armored vehicles.

As a result of the rigid coupling, the mobility of the vehicles is entirely maintained and can even be enhanced by integrated structural dampening.

In the following, with the aid of an embodiment illustrated in the drawings, the construction principle of the inventive vehicle, as well as further details, are explained in greater detail.

The drawings show:

Fig. 1 in a side view an armored wheeled vehicle composed of individual sections in the coupled state with a mounted weapon;

Fig. 2 in a side view the wheeled vehicle of Fig. 1 in the uncoupled state with the weapon removed;

Fig. 3 in a perspective illustration the wheeled vehicle of Figs. 1 and 2 in the uncoupled state;

Fig. 4 in a perspective illustration that is slightly enlarged relative to Figs. 1-3, the drive section of the wheeled vehicle of Figs. 1-3 without wheels.

The armored wheeled vehicle, which is illustrated in the drawings in a very schematic manner, and comprises individual sections, has a drive section 1 with two wheel axles 1.1 and 1.2, and contains in a not separately illustrated manner, a drive unit that can, for example, be embodied as a diesel electric drive. The vehicle furthermore has a mission section 2 that in its rear portion is provided with a wheel axle 2.1 and that at its front portion is provided with support members 2.2 that can be folded out or extended. The mission section can have very different configurations. For example, it can contain a personnel compartment and it can, as indicated in Fig. 1, be provided on its upper side with a weapon 3 that is operable outside of the mission section.

The forward portion of the mission section 2 can be detachably coupled to the rear portion of the drive section 1 via the vertical plane of

separation T. In this connection, in the context of the invention "plane of separation" means a vertical plane that, as illustrated in Fig. 2, in the uncoupled and moved apart state of the two vehicle sections can be disposed between them in such a way that neither of the two modules is intersected by the plane.

To achieve a rigid structural coupling between the two sections of the wheeled vehicle, drive section 1 and mission section 2 are respectively provided in the coupling cross-section with a rear wall and a front wall respectively, which for the drive section 1 is composed of adjoining in part horizontal, in part vertical, and in part inclined partial sections 4.1, 4.2, 4.4 and 4.5, whereby partial sections disposed on both sides of the vertical longitudinal central plane are indicated by the same reference numerals. For the mission section 2, the front wall is correspondingly composed of adjoining partial sections 5.1, 5.2, 5.3, 5.4 and 5.5.

As can be seen from the drawings, the rear wall and the front wall are thus embodied in an offset manner relative to the cross-sectional plane, so that various partial sections of the respective wall are disposed in different cross-sectional planes. As can also be seen from the drawings, the result of this is that in the side portions, the rear of the drive section 1, in the coupled state, engages under the

corresponding side portions of the mission section 2. A forwardly projecting part 2.3 of the mission section 2 engages between these side portions 1.3 of the drive section 1 that extend under the mission section 2. Disposed in this projecting part 2.3 of the mission section 2 is a passageway 6 (see Fig. 3) that adjoins the personnel compartment of the mission section 2 with a passageway 6.1 (see Fig. 4) that communicates with the compartment for the driver's stand within the drive section 1. By means of wall sections, the two passageways 6 and 6.1 can be sealingly joined to one another, whereby a peripheral seal 6.2 in these wall sections, in the joined-together state, is disposed in the interior of the vehicle in a manner to be unaccessible from the outside, and at this location ensures an ABC protection.

The shapes of the drive section 1 and of the mission section 2 are adapted to one another, and the two sections can be placed against one another in such a way that, as can be seen from the drawings, a compact overall vehicle results in which drive section and mission section are rigidly interconnected.

The rigid coupling of drive section 1 and mission section 2 is effected via bolt or screw connections disposed at four corner points of the mission section 2 and of the drive section 1; the connections at the

drive section 1 are designated by 9.1, 9.2, 9.3 and 9.4, while the screw or bolt connections that can be seen at the mission section 2 in Fig. 3 are designated with 9.1', 9.2' and 9.4'.

A self-centering guide mechanism having two centering pins 7.1 and 7.2, disposed on the vertical longitudinal central plane of the drive section 1, and corresponding receiving elements 7.1' at the opposite locations of the mission section 2, see to it that the mission section 2 can be moved directly from the drive section 1. Instead of the bolt or screw connections, coupling devices having rapid or snap-type closures can also be provided.

The coupling of electrical and/or hydraulic and/or pneumatic devices in the drive section 1 and the mission section 2 is effected via connection mechanisms having self-centering elements. As can be seen from Fig. 4, for this purpose freely mounted, self-centering coupling plates 8.1 and 8.2 are disposed in the rear portion of the drive section 1, and have associated therewith appropriate non-illustrated elements on the mission section 2.

In a non-illustrated manner, dampening means can be disposed in the region of the plane of separation T between the parts of the vehicle sections 1, 2 that are placed against one another.

Furthermore, for the ballistic protection of the overall vehicle, it is possible to dispose in the region of the plane of separation T structural sheets and/or protective plates that overlap the separating line or plane between the vehicle sections 1, 2. The peripheral seal 6.2 can be embodied as an inflatable seal.